

ABSTRACT OF THE DISCLOSURE

An apparatus for creating a conductive damascene by filling copper in a plug portion formed on an insulating film, the apparatus comprising an etching chamber 151A for etching a low-k material, a vacuum transfer chamber 153 for transferring in vacuum a sample being etched, a receiving means for receiving the transferred sample, a voltage application means, a copper barrier processing chamber 151B for performing a copper barrier process by reforming the surface of the sample through carbonizing process, nitriding process, brominating process, boride-forming process, reduction process, amorphous-forming process or a combination thereof, which is realized by making ions accelerated by voltage or neutral particles obtained by disselectrifying the accelerated ions collide against the etched surface, and a high vacuum processing chamber 151C where copper is filled in the plug portion having the etched surface with a copper barrier.